Sustainability & Ethics – key issues for packaging trends

Anna Lúcia Mourad*, Sandra Balan Mendoza Jaime, Eloisa Elena Correa Garcia

CETEA – Packaging Technology Center / ITAL – Institute of Food Technology, P.O. Box 139, ZIP 13070- 178, Campinas, SP, Brazil
* Corresponding author. E-mail: *anna@ital.sp.gov.br*

ABSTRACT

Sustainability & Ethics is one of the five macrotrends identified by a group of experts at CETEA/ITAL - Packaging Technology Center of the Food Technology Institute that could drive the processes of innovation and development in the packaging area in the coming years in Brazil. LCA, in its simplest form, *Life Cycle Thinking*, is a powerful tool to be applied to continuous improvement of the existing processes as well as to lead to new products and process development. Many examples of the application of *Life Cycle Thinking* have been achieved with significant measurable reductions in energy, water, raw materials, emissions to water, and air and solid waste residues. The application of this tool for packaging and also for the food sector puts forward four guidelines to be pursued over the next decade: Optimization of the product/package system; Reuse & Recycling; Waste Management & Reverse Logistics and Credibility & Ethics.

Keywords: Sustainability, packaging, life cycle thinking, trends

1. Brazil Pack Trends 2020 report

In order to establish guidelines that could drive the processes of innovation and development in the packaging area in the coming years in Brazil , a group of experts at CETEA/ITAL - Packaging Technology Center of the Food Technology Institute - with over twenty years experience in research and consultancy, identified five macro trends that constitute challenges and opportunities that could encourage enterprises to think about the future possibilities for packaging: Convenience & Simplicity, Aesthetics & Identity, Quality & New Technologies, Sustainability & Ethics and Safety & Regulatory Issues (Sarantopoulos et al., 2012). The purpose of this article is to show the main topics concerning one of the macrotrends - Sustainability & Ethics, which was developed in Chapter 7 of the report Brazil Pack Trends 2020 (Mourad and Jaime, 2012). More than 70 documents including those on global trends were extensively studied which, using the authors´experience, gave rise to the main drivers of this chapter. So, the following sections of this article show the main points discussed in this chapter, but here applied to the food packaging sector.

2. Environment: a global issue

The first aspect addressed in this chapter is the global character that environmental issues have taken on. Globalization, which has intensified from the second half of the '80s, has transformed the environmental discussions from national to global. The social-related aspects refer to global society and not only the regionalized effects. Through globalization, humanity becomes aware of the risk of environmental degradation due to the potential destructive capacity of nuclear plants and contamination of air, water, soil and the food chain by chemical industries.

A new global conscience has gradually arisen as the transformations that the planet has been passing through, accentuated by climate changes that can be clearly seen in every continent, have been understood as consequences of the actions of mankind on nature (IPCC, 2007). The landslides that happened in 2011 in Teresópolis, in the State of Rio de Janeiro, due to a long rainy period, as well as the floods in Pakistan in 2010, the heat waves in France in 2003, the drought in Russia in 2010, the heat in the Alpine resorts in 2006 and the drought in USA in 2012, among other events, are reflexes of climate change. Since these events have been increasingly frequent, the need is urgent for all sectors of the economy, including the packaging sector, to contribute to the reduction in the emission of greenhouse gases and implement actions to reduce the anthropogenic impact on our system.

3. Life Cycle Thinking

As Life Cycle Assessment (LCA) studies measure various forms of environmental impact such as global warming, natural resource depletion, acidification, eutrophication and human toxicity, among others, it has been

considered as one of the best instruments for the quantification of human action on the planet. The LCA tool itself is very complex and requires considerable time for completion. For this reason, partial LCA results for identification of opportunities for improvement, including all or almost all of the life cycle phases, have grown in recent years and are based on "life cycle thinking". These studies, although they cannot be classified as a "life cycle assessment", have been very useful for understanding the environmental interfaces of products and have lead to the development of products with lower environmental impacts.

Thus, with the greater maturity of environmental issues, this new more holistic view, "Life Cycle Thinking", has been used in the packaging context. This approach can be translated as "a continuous movement of rethinking packaging", considering the time when natural resources are extracted from nature for their production up to the final destinations of residues and emissions originated from these processes. Figure 1 illustrates how *Life Cycle Thinking* can be used for system optimization.

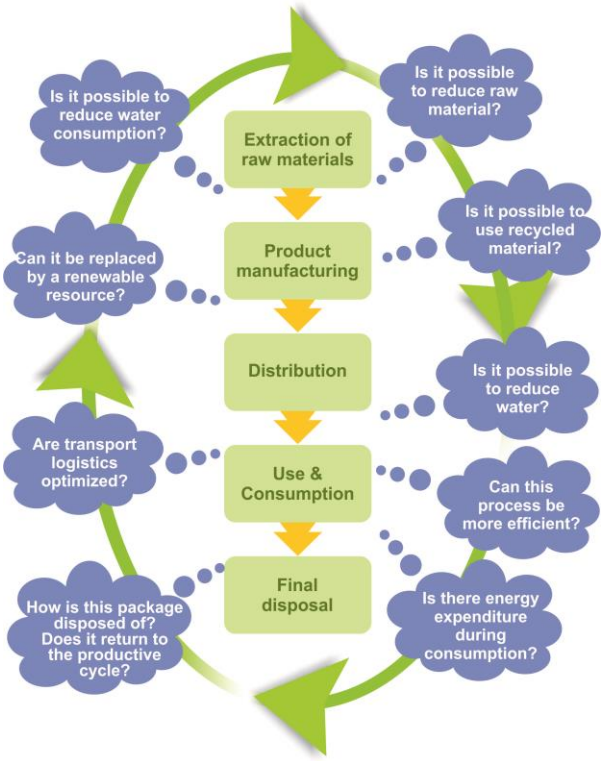

Figure 1. Schematic representation of Life Cycle Thinking.

Through these questions, asked at every phase of the product life cycle, *Life Cycle Thinking* is carried out. The registering, however, of the obtained reductions, must follow the LCA methodology strictly, so the calculated reductions are effectively proved on an internationally recognized scientific basis. It is also important to include analysis of possible trade-offs, ie, possible environmentally unfavorable points arising from the implementation of new processes, such as the increase of emissions to water when increasing the recycling rate or loss of packaged products when reducing the mass of some packages which become more fragile, and so on.

Packages have always been linked to environmental issues and their use is often questioned. It is important to remember that through the package it is possible to distribute food from its places of origin to multiple, often remote, points of consumption. Another aspect to remember is the importance of its correct specification. The use of inappropriate / undersized packages leads to food loss and consequently all natural resources extracted from the environment throughout their supply chain. Thus, the loss of food by failure or lack of packaging has negative consequences for the environment, many times greater than the impacts associated with the manufacture or disposal of packaging.

4. Guidelines for sustainable product/packaging design

4.1. Optimization of the product/package system

Life Cycle Thinking can currently be considered as one of the most important tools for the development of packaging and products that aim to become more sustainable. For packages, this concept means to "rethink the packaging associated with its lifecycle, challenging the limits of weight, shape, materials and accessories, without, however, compromising the integrity and product shelf life." When the wish to become less costly to the environment becomes a goal clearly defined, it reduces the weight of what is not essential; it goes to the limits of technical requirements, values the efficiency more than appearance and generates more responsible packaging options.

When the relation between product or service and the quantity of used package is optimized, the consumption of natural resources is indirectly reduced, such as oil, water, sand, coal and minerals, among others, and, consequently, the resulting emissions to the air, water and soil. This way, the optimization of materials should be one of the priorities in the search for systems with less environmental impact.

Many examples of the application of *Life Cycle Thinking* developed between 2009 and 2013 in a partnership consisting of a retailer (Walmart), manufacturers (Walmart suppliers) and a research institute (CETEA/ITAL) are described with significant measurable reductions in energy, water, raw materials, emissions to water, air and solid waste residues (Walmart Brasil, 2010 and 2011).

Coca-Cola Brazil invested in their organic product, Matte-Leão, which was produced in their new unit. Considered a "green factory", it has received the Leadership Energy and Environmental Design (LEED) certification, issued by the Green Building Council, which assures good planning with the construction and use of energy. Another important innovation was the printing of the life cycle of tea from mate herb on the package, playing an important role on educational and environmental consciousness. The package has been modernized by its clean design: 90% of the printing ink quantity has been reduced (Figure 2).

Figure 2. Organic Matte Leão, by Coca-Cola: 90% reduction of the printing ink. Source: Walmart, 2011.

The company Cargill has shown that it is possible to innovate on traditional products such as the Liza oils line (Figure 3), which, even maintaining the shape, thanks to a re-engineering work on the bottle and cap, a 10% reduction in the package weight was possible, which changed from 22 to 20 grams without significantly affecting its mechanical performance.

Figure 3. Example of optimization with packaging weight reduction. Source: Walmart, 2010.

Derived from technological investment, Danone has applied FOAM technology, which expands the plastic sheet used in the packaging, making it aerated, reducing its mass and, therefore, the consumption of natural resources. This change brought about a 9.4% reduction in weight of a Danoninho pot, without compromising its mechanical resistance (Figure 4).

Figure 4. Example of application of new technology for weight reduction. Source: Walmart, 2011.

4.2. Reuse & Recycling

On the scale of priorities for solid waste management, the minimization of waste generated by optimizing and reducing packaging systems should be encouraged first. Reuse is the second priority, followed by recycling, in third place.

Coca-Cola Brazil launched, in 2011, the 2.5 liter bottle containing 20% of post-consumer recycled PET resin food grade (PCR PET). There is, currently, a bottle-to-bottle recycling plant that was approved by the Brazilian Health Surveillance Agency (Anvisa). The recycled bottle (Figure 5) has the same characteristics as produced from virgin PET resin. In this process, the used bottles used are selected, crushed and washed by an efficient process of decontamination and recovery of the molecular weight of PET, removing contaminants at levels required by food contact packaging legislation. The clean material is then used in the manufacturing process of new bottles. The technology used for the purification of post-consumer PET was created by the company United Resource Recovery Corporation (URRC), from the United States. The use of post-consumer PET encourages the entire chain of collection of these packages, generating income for the street collectors.

Figure 5. Recycled PET bottle. Source: Walmart, 2011.

Example of New Can metallic packaging design, developed by Jiwoon Park and Kwenyoung Choi, has a format that allows for the reduction of volume by one-third of the original after consumption of the product by means of twisting and compression movements.

Figure 6. Example of a package that allows for volume reduction after product consumption. Source: YANKO DESIGN, 2009.

The Taiwanese company Panorama SOY Ink Co. Ltd. has developed inks based on recycled vegetable oils. The inks contain 45% of post-consumer oil, 21% of pigments and 34% of tar, do not contain organic volatile compounds, have good resistance to abrasion, as well as high gloss and good color stability. They dry faster, have better defined impression than traditional paints and can be applied on surfaces of paper or plastic.

4.3. Management of residues & reverse logistics

The establishment of the reverse logistics chain is not a simple task and involves many aspects. In fact, in cases where the use of packaging in a second production process already provides a financial return for the agents involved, as in the case of old corrugated paperboard boxes and aluminum cans, the return of post-consumer packaging already exists. However, in most cases, that chain needs to be created and established. It is very important, however, to realize that the creation of this chain does not occur spontaneously. If there does not exist a clear determination of the generating sector in returning these materials to the production cycle, or an appropriate destination, this chain cannot be established. In order to ensure that the reverse chain is real and can be maintained, it must be economically viable, which means that it must pay all the involved agents in an adequate way.

The Brazil Pack Trends report also presents a successful Tetra Pak case which established a reverse logistic chain for aseptic milk packaging in the country. This perception of the need to go beyond one´s own gates was perceived long ago by Tetra Pak, which is a great example of a company that was able to foster, encourage, and establish the reverse logistics chain of the aseptic packages after use. These containers of liquids are formed by the combination of three materials: cardboard, which gives rigidity and packing structure, alternating layers of polyethylene (PE), which protect the cardboard from external moisture and also constitute the primary contact material with the liquid beverage, and an aluminum foil (Al), which preserves the aroma and extends the shelf life of the product which reaches, in the case of milk for example, up to six months.

This multilayer material is currently separated from the common waste (the current recycling rate is 28%) and the cellulosic fiber content recovered in “hidrapulpers” present in paper recycling companies. The remaining residue consisting primarily of polyethylene and aluminum, is currently intended for the manufacture of PE/Al tiles and to the EET-Brasil Aluminum and Paraffin Ltd. company at Piracicaba. At the EET company, through a plasma process (~15,000ºC), high purity aluminum is obtained and the polyethylene is transformed into paraffin. LCA studies carried out by CETEA attest that recycling has environmental benefits, even considering the impacts of all these stages of the reverse chain.

The creation of this chain, exemplified in Figure 7, was strongly encouraged by Tetra Pak, which took nearly two decades to find the technology and partners that could make the reuse of aseptic packaging environmentally and economically viable.

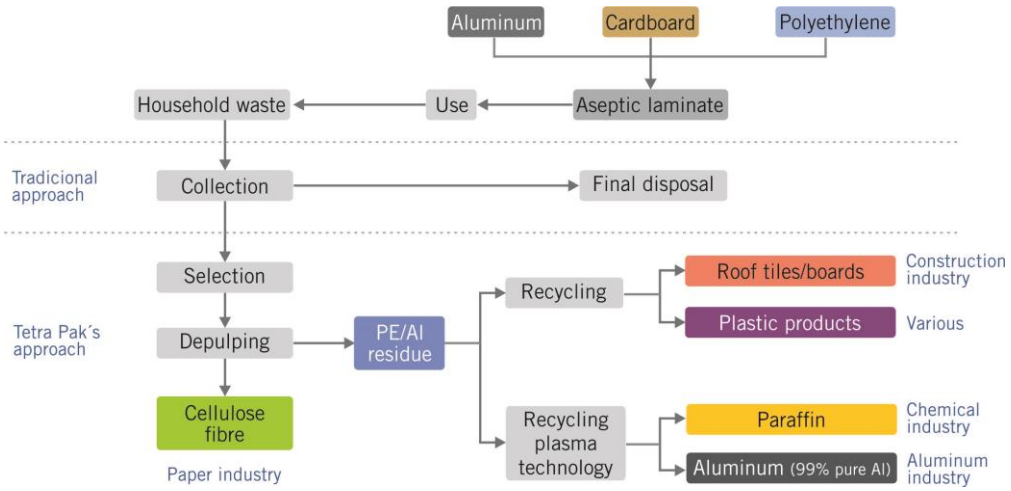

Figure 7. Productive and post-consumer aseptic package recycling flowchart organized by Tetra Pak. Source: Adapted from Osato et al, 2007).

The creation of these products increased the price paid for the collected post-consumer packaging by 79% between 2004 and 2007, which reached EUR 120 per ton and started to be segregated from the household waste.

5. Credibility & Ethics

With the globalization of environmental issues, the strengthening of social networks, the importance of the end consumer´s awareness and the involvement of the whole society in areas before treated only by experts, it is very important that environmental communication will be carried out according to internationally accepted metrics.

Many manufacturers have already noticed the need of having a better attitude to society, extending the responsibility concerning their products to beyond their gates. Such a movement has been called Extender Producer Responsibility (EPR). The publication of sustainability reports, according to the GRI Initiative, is a practice incorporated by several companies and the public sector that have a commitment to sustainable development and have already put into practice the EPR principles. The initiatives involve actions all along the production chain. GRI has been conceived so it is possible to communicate in a transparent way the entrepreneurial action of economic, environmental and social range, according to a method by which a company can be compared both internally and externally. GRI involves principles of balance, comparability, exactness, periodicity, reliability and clearness.

The credibility of the products has been attested using standardized environmental labels and self declarations; both volunteer and offer information about the environmental benefits of a service or product in general terms or one or more specific environmental aspects. The environmental performance certification of a product or service is a world-wide practice, with Germany being, in 1977, the first country to implement a National Program of Environmental Labeling for products, the Blue Angel. This kind of program has been used as a model for many other countries, becoming a strong worldwide trend, examples being: Canada (Environmental Choice), Japan (Eco Mark), United States (Green Seal), Nordic Countries – Denmark, Norway, Sweden, Finland and Iceland (The Swan), and Europe (Eco-Label), among others.

These programs belong to the Type I Environmental Labeling, established in the ISO 14024 and are also known as “green labels” or “ecolabels”. It is a voluntary methodology of certification and labeling for environmental performance of products and services, with a great importance for the implementation of environmental policies aimed at consumers, helping them to choose products less harmful to the environment. The “green label” is generally given by a national certification organ (third party) and is based on multiple criteria from studies of Life Cycle Assessment of a given sector, with focus on reducing the environmental impacts associated with the selected product category. The certification of cellulosic materials by internationally recognized agencies has become a more intense reality in Brazil and around the world, highlighting the label Forest Stewardchip Council (FSC), applied to the cellulosic packages sector. The Brazilian Program of Forest Certification (Cerflor), applicable nationwide, prescribed to the standards elaborated by ABNT and integrated

into the Brazilian System of Conformity Assessment. Inmetro is another forest certification program used in Brazil, internationally recognized by the Program for the Endorsement of Forest Certification (PEFC), an international organization that unites systems of forest certifications all over the world. Both programs attest to the sustainable forest handling and the traceability of the custody chain, offering to the consumer the guarantee that the product follows criteria based on practices that promote biodiversity preservation, responsible use of forest resources and the maintenance of soil, air and water quality. They still analyze the practices of companies in the economic and social development of the region where they work. Another strong trend in the package sector is the adoption of the environmental self-declaration for companies, aiming at making public the environmental improvements obtained along a product or service life cycle. Although the self-declaration may offer flexibility and autonomy, as it does not demand the certification by a third party, the companies should make responsible declarations that can be verified and based on scientific rigor. This kind of declaration is called Type II Environmental Labeling and can be found standardized by the ISO 14021, which presents the policies for the use of texts, symbols, and graphs associated with the publicizing of product or service environmental improvements. Texts with vague or non-specific declarations, for example, "environmentally safe", "environmentally friendly", "Earth friendly", "do not pollute" and "ozone layer friendly" should not be used. The consumer search for products with less environmental impact has helped the high investment by companies in selling with environmental appeal. This "green" market trend has stimulated companies to use the moment to associate their products with dubious and opportunist ecofriendly attributions, with no clear criteria that back them up in their environmental pretensions, or even to symbols and visual appeals that can induce the consumer to wrong conclusions about a product or service. Appeals that are presented as fake or induce the consumer to wrong conclusions about a product or service have been called *Greenwashing*. Aiming at describing, understanding and quantifying the growth of *Greenwashing* in the market, the Canadian environmental marketing consultancy TerraChoice has developed a research methodology by printing on the packages orientations about environmental self-declarations established by the ISO 14021 standard. In that report, such fake or dubious appeals were classified in seven categories, called The Seven Sins of *Greenwashing*. Recently, many manufacturers have launched products implying that they are obtained from natural sources. This does not certify that the product was manufactured using the lower environmental impact technologies available, often hiding trade-offs (sin 1) concerning processes with high loads of pollutants. It is possible to see many statements that attest carbon footprint reduction without, however, supporting information by a third party that can validate these statements is the committing of "no proof" (sin 2). To state that a product is compostable in places where an infrastructure for residue collection and composting plants do not exist, is to commit the "sin of vagueness" (sin 3). Statements such as "heavy metal free" or "CFC free" according to the TerraChoice description, can be classified "a sin of irrelevance" (sin 4), since the maximum limits of these components are determined by legislation.

Avoiding *Greenwashing* does not mean the expectation of a perfect product, but that the honesty, transparency and scientific base are founded on the environmental declaration. To combat *Greenwashing*, the Environmental Packaging International (EPI) in the United States released in October 2009 a database of sustainable packaging materials, in which the package suppliers submit data from which information about sustainability of their materials are reviewed and confirmed by a third party. Similarly, the ISO 14021, environmental self-declaration, does not accept "vague" and inaccurate texts either such as "eco-friendly", "environmentally safe", "eco responsible", and so on.

6. References

IPCC - Intergovernmental Panel on Climate Change (2007). Climate change 2007: synthesis report. IPCC, 52 p. <http://www.ipcc.ch> Accessed 15 June 2012.

Mourad AL, Jaime SBM (2012) Capítulo 7: Sustentabilidade & Ética. In: Sarantopoulos CIGL, Rego RA (eds) Brasil Pack Trends 2020. ITAL, Campinas, pp 171-203.

Orsato R J, Von Zuben F, Wassenhove LV (2007). Turning waste into wealth. International Commerce Review, v 7, n 2, pp 116-123. DOI: 10.1007/s12146-007-0016-y.

Sarantopoulos CIGL, Rego RA (editors) (2012). Brasil Pack trends 2020. ITAL, Campinas, 228p.

Walmart Brasil (2010) End to end Sustainability 1st edn. Walmart Brasil, Barueri, 68p <http://www.walmartbrasil.com.br>. Accessed 05 April 2014.

Walmart Brasil (2011) End to end Sustainability 2th edn. Walmart Brasil, Barueri, 44p <http://www.walmartbrasil.com.br>. Accessed 05 April 2014.

Yanko Design (2009) Twist and trash the can < http://www.yankodesign.com> Accessed 20 August 2012.

This paper is from:

Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector

8-10 October 2014 - San Francisco

Rita Schenck and Douglas Huizenga, Editors
American Center for Life Cycle Assessment

The full proceedings document can be found here:
http://lcacenter.org/lcafood2014/proceedings/LCA_Food_2014_Proceedings.pdf

It should be cited as:

Schenck, R., Huizenga, D. (Eds.), 2014. Proceedings of the 9th International Conference on Life Cycle Assessment in the Agri-Food Sector (LCA Food 2014), 8-10 October 2014, San Francisco, USA. ACLCA, Vashon, WA, USA.

Questions and comments can be addressed to: staff@lcacenter.org

ISBN: 978-0-9882145-7-6